Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Expanding Flexible Use in Mid Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	

COMMENTS OF ZEBRA TECHNOLOGIES

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I. BACKGROUND

Zebra Technologies currently produces and deploys Ultra Wideband (UWB) real-time locating systems (RTLS) for a variety of applications including safety and professional sports. For example, the National Football League (NFL) is using Zebra's Dart technology for real-time player and ball tracking during its games. These systems are installed in every NFL stadium in the USA and have been in place for multiple years. The experience gained from deployments to over 30 stadium venues has given Zebra a unique perspective on the utilization of the RF spectrum between 5.925 and 7.125GHz.

Zebra's Dart RTLS transmitters are certified under FCC Part 15.250[1], which was created in 2005 by FCC Second Report & Order (See ET Docket 98-153)[2]. This Order was the culmination of several years of proceedings, beginning with the NOI of September 1, 1998[3], and ending with the Third MO&O of August 11, 2010[4], in which the established limits were upheld. Part 15.250 pertains to the same 5.925-7.125 GHz spectrum which is currently the subject of the NOI of GN Docket 17-183. In the heated debate leading up to the First Report and Order of April 22, 2002, Zebra (then as Multispectral Solutions) was a proponent of a spectrally responsible approach which would protect incumbent services.

For the following reasons, Zebra opposes any new allocation of 5.925-7.125 GHz for unlicensed operation.

II. PART 15 RULES ALREADY EXIST FOR 5.925-7.125 GHZ

The unlicensed allocation under Part 15.250, like that of the related Subpart F, was designed to protect incumbent licensed users in that band. By recognizing that incumbent users typically had channel bandwidths of 25MHz or less, the requirements of Part 15.250 (and to a greater extent Subpart F) force there to be a large discrepancy between the bandwidths of unlicensed and licensed users. This, along with the limits on peak and average EIRP spectral density, allows a useful Part 15 system to be built, while taking advantage of pulse desensitization as a natural means to protect victim receivers.

Qualcomm states that "there currently is no unlicensed broadband allocation in the 6 GHz bands". This in incorrect. The commission made bandwidth available 15 years ago. As pointed out by All Points Broadband et al., "Commission rules already allow other types of Part 15 operations in this band.", but lament that "the existing rules make broadband operations impossible". However, these comments only reference the general emission limits of Part 15.209[5], and not Part 15.250.

Based upon those comments, it would appear that the proponents of a new Part 15 allocation are interested in securing the ability to transmit at a much higher average spectral density level than currently

[1] 47 C.F.R. §15.250.

[2] *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, Second Report and Order and second memorandum Opinion and Order, FCC 04-285, ET Docket No. 98-153, December 16, 2004.

[3] *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, Notice of Inquiry, FCC 98-208, ET Docket No. 98-153, September 1, 1998.

[4] *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, Third Memorandum Opinion and Order, FCC 10-151, ET Docket No. 98-153, August 11, 2010.

[5] 47 C.F.R §15.209.

allowed. As pointed out by DecaWave, Indotraq, and Secure Care Products, allowing a higher average power level would interfere with existing UWB devices currently utilizing that spectrum. The comments of the IEEE, as proponents of a new allocation clearly anticipate a negative impact to UWB devices.

Our experience from our many installations clearly illustrates that Zebra's deployments in NFL stadiums would be rendered useless by thousands of transmitters in new U-NII bands. Furthermore, Zebra also has many deployments of Dart RTLS systems in safety applications. Random interference to those installations would create hazardous, life-threatening conditions.

OET has already established spectral density limits for 5.925-7.125. This was the result of the arduous process that led to the establishment of Part 15.250 and Subpart F. The development of Part 15.250 and Subpart F did not increase the average emission limits over the general emission limits of 15.209. In fact, the average emission limits were made more restrictive by decreasing the sampling window from 100ms down to 1ms. This was provided as a trade-off for allowing a relaxation of the limits and measurement procedure for peak power. This change further served to mitigate against interference to incumbent users by creating an incentive for UWB transmissions to consist of short bursts of high peak-to-average pulses. In addition to pulse desensitization that reduced the received amplitude, victim receivers also acquired benefits from short duration transmissions. It would be inconsistent to now allow higher average EIRP limits for one class of device and not all classes. Any new limits for new U-NII bands would form the basis of an argument for the creation of new, higher power limits for Part 15.250 and Subpart F devices.

In addition to spectral density limits, Part 15.250(c) also establishes operational restrictions. From the Second Report and Order, concerns over potential proliferation of interference sources led to the restriction of 15.250 devices from being used for the operation of toys. Furthermore, 15.250(c) prohibits both fixed outdoor infrastructures and operation on aircraft as a response to the concerns of NITA regarding the potential for establishment of wide-area communication systems. The stated purpose of new U-NII bands[6] would directly conflict with these same concerns.

III. ULS IS INACCURATE

Several commenters, including Broadcom, Motorola Solutions, All Points Broadband et al, and Qualcomm, have suggested using a database derived from ULS data for interference mitigation. Zebra's recent experience with outdoor installations has shown that ULS is not only inaccurate, but that no mechanism apparently exists to correct it.

Zebra often deploys Dart UWB systems outdoors, and occasionally must deal with interference from incumbent licensed users in the 5.925-7.125 GHz bands. This is generally accomplished by using directional antennas and/or installing RF filters to suppress the interference. Zebra understands and supports the rules regarding the priority of licensed users and makes every effort to accommodate the requirements of these users.

As an example, an incident occurred at an installation in Santa Clara, CA in 2016. Zebra engineers were able to track down a directional transmitter at 6.685GHz on a tower atop Mt. Allison which had no record in ULS. Conversely, a transmitter that was listed in ULS to be atop Loma Prieta Mountain at a frequency of 6.685 GHz was absent. It appears that some shuffling of link directions had taken place. Efforts to engage FCC/WTB to address the inaccuracy halted when it was realized that Zebra was a provider of Part 15 devices and not a licensed user. The result was that the inaccuracy in ULS was not corrected. These

[6] See, for example, comments of "WiFi Alliance" and "Wireless Broadband Alliance" regarding GN 17-183.

situations appear to be handled by local coordination and, as a result, the inaccuracies persist until local coordination efforts fail.

A similar incident occurred at Zebra's installation for the LA Chargers at StubHub Center in Los Angeles. In this case, a signal at 6.765GHz was clearly observed, with no corresponding ULS entry.

IV. 5.925-7.125 HAS MOBILE LICENSEES

Zebra's experience with sporting events has shown that mobile operation within 6.425-6.525 GHz, as well as BAS operation in the 6.875-7.125 GHz band is extremely fluid. FCC Rule 74.24 allows for short-term operation in the BAS band without prior authorization which permits this fluidity. During this time period of utilization, the mobile band is commonly allocated dynamically by local coordinators. It should be noted that in particular, sporting events attract mobile camera operation for broadcast as well as in-house (Jumbotron) video.

One increasingly common use of 6.425-6.525 GHz is by local law enforcement for airborne video. Air surveillance for traffic monitoring is becoming commonplace not only for major sporting events, but also for routine police work. In Zebra's experience, the comments of the American Association of State Highway and Transportation Officials are extremely appropriate and relevant.

Proliferation of Part 15 devices at higher EIRP levels than those currently allowed would not only create unacceptable levels of interference to existing licensees, but would also do so in very crowded environments in which the use of that band by public safety agencies is most critical. Furthermore, mobile use of that band by both broadcast and law enforcement will likely render the corresponding part of the spectrum useless for unlicensed operation and create contention for the remaining segments of any new U-NII allocation.

Restrictions based on indoor/outdoor operation as suggested by Broadcom would be unenforceable. Utilization in ambiguous environments such as stadiums would be common. This would result in thousands of devices attempting to operate simultaneously in spaces that are tightly confined, yet generating large amounts of interference over a wide open area.

V. SUMMARY

Zebra is committed to working cooperatively to explore all possible options that may make more effective use of the limited, and shared resource of radio bandwidth. However, users within the 5.925-7.125 GHz bands include police, broadcasters, first responders, C Band satellite systems, as well as tracking systems such as our sports and safety systems. Zebra routinely works with coordinators, examines ULS, and performs on-site surveys in order to assess the RF environment at each installation. Receivers with custom filters and diversity have been developed and deployed in order to accommodate both fixed and mobile incumbents. It is precisely because of the spatial and spectral *predictability* of these bands that Zebra is able to coexist.

Opening up the band to U-NII type systems would cause a significant increase in *unpredictable* interference to all of these current users in addition to other users identified in the comments. The concentration of thousands of potential users that could be trying to access the bandwidth using phone, data, and video from smart phones at an event such as an NFL football game would increase this interference to a level that would make the bands unusable by the present-day user base operating within the current regulations.

Therefore, Zebra requests that the Commission take no action on any further allocations in the 5.925-7.125 GHz bands for unlicensed devices.